

DAFTAR PUSTAKA

- Addina, S., S. Subaryono, dan S. Sukarno. 2020. Aktivitas oligosakarida alginat sebagai antioksidan dan inhibitor alfa glukosidase. *Jurnal Pascapanen dan Bioteknologi Kelautan dan Perikanan*, 15(1), 47-61.
- Addina, S., Y. Yurnaliza, dan U. Harahap. 2018. Produksi alginat oligosakarida dari natrium alginat menggunakan enzim alginat liase dan karakterisasinya. *Jurnal Kimia Sains dan Aplikasi*, 21(3), 143–149
- Afni, F. S., S. Purwaningsih, M. Nurilmala, dan Peranginangin. 2017. Produksi alginate oligosakarides (aos) sebagai bahan prebiotik menggunakan enzim alginat liase. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 20(1). IPB University.
- Agustina. 2013. Produksi dan karakterisasi natrium alginat dari rumput laut coklat (*Sargassum* sp.) dengan variasi waktu ekstraksi. [Skripsi, Universitas Diponegoro]. UNDIP Repository.
- Aida, T. M., T. Yamagata, M. Watanabe, L. A. Smith. 2010. Depolymerization of sodium alginate under hydrothermal conditions. *Carbohydrate Polymers*. 80(1): 296–302.
- Alfa. 2023. Alginate oligosaccharide. Diakses March 22, 2026, Retrieved from <https://marinechem.alfa-chemistry.com/alginate-oligosaccharide>.
- Association of Official Analytical Chemist (AOAC). 1990. Official Method of Analysis of the Association of Official Analytical of Chemist. Arlington(US): The Association of Official Analytical of Chemist
- Dzakiy, M. A. 2014. Optimalisasi feed additive herbal terhadap bobot badan, lemak abdominal dan glukosa darah ayam broiler. *Bioma: Jurnal Ilmiah Biologi*, 3
- Darmawan, R., H. Suryadi, S. Raharjo, and C. Wijaya. 2021. Evaluation of physicochemical properties of a hydrocolloid-based functional food fortified with *Caulerpa lentillifera*: A D-optimal design approach. *Polymers*, 13(17), 2819.
- Falkeborg, M., L. Cheong, C. Gianfico, and K. Sztukiel. 2014. Alginate oligosakarides: enzymatic preparation and antioxidant property evaluation. *Journal of Food Chemistry*. 164:185.
- Fransiska, D., M. Sirait, dan N. Wijayanti. 2020. Karakteristik natrium alginat dari Banten, Lampung, dan Yogyakarta. *Jurnal Teknologi Pangan*, 15(2), 123-130.

- Guo, J., L. Ma, J. Ding, and J. Ge. 2016. Alginate Oligosaccharide Prevents Acute Doxorubicin Cardiotoxicity by Suppressing Oxidative Stress and Endoplasmic Reticulum Mediated Apoptosis. *Marine Drugs*, 14(12), Article 231.
- Handayani, T. 2018. Mengenal makroalga *Turbinaria* dan pemanfaatannya. *Oseana*, 43(4), pp.28–39.
- Herdianto, R., dan A. Husni. 2019. Optimasi suhu ekstraksi terhadap kualitas alginat yang diperoleh dari rumput laut *sargassum muticum*. *Jurnal Teknik ITS*, 8(2), A153–A157
- Hu, X., X. Jiang, H. Hwang, and H. Guan. 2015. Promotive effects of alginate-derived oligosaccharides on growth performance, antioxidant capacity, and intestinal function in broiler chickens. *Carbohydrate Polymers*, 123, 1–7.
- Jayanudin, Zakiyah, F. Nurbayanti. 2014. Pengaruh suhu dan rasio pelarut ekstraksi terhadap rendemen dan viskositas natrium alginat dari rumput laut cokelat (*Sargassum* sp.). *Jurnal Integrası Proses*. 5(1): 51-55.
- Juniarti, N., dan F. Hiola. 2019. Pengaruh pemberian tepung rumput laut pada ransum ayam broiler terhadap kadar lemak dan kolestrol. Universitas Negeri Makassar. Makassar.
- Kavitha, R., S. Prakash, and K. Manivannan. 2019. Formulation of alginate-based hydrogel from brown seaweed *turbinaria conoides* for biomedical applications. *International Journal of Biological Macromolecules*, 129, 611–618.
- Khajouei, R., J. Keramat, N. Hamdami, and G. Djellveh. 2018. Extraction and characterization of alginate from the brown seaweed *Nizimuddiniana zanardini*. *International Journal of Biological Macromolecules*, 118, 1073–1081.
- Korzycka, A., S. Derkach, Y. Kuchina, and N. Voron'ko. 2021. Rheological properties and structure of alginate-based systems: A review. *Carbohydrate Polymers*, 261, 117879
- Kordi, M. G. H. 2011. Kiat Sukses Budidaya Rumput Laut di Laut dan Tambak. Andi Offset, Yogyakarta.
- Kim, H. S., Lee, and E. Y. Lee. 2011. Alginate lyase: structure, property and application. *Biotechnology and Bioprocess Engineering*, 16, 853-851.
- Lee, K. Y., and D. J. Mooney. 2012. Alginate properties and biomedical applications. *Progress in Polymer Science*, 37, 106–126

- Li, L., Jiang, H. Guan, and Wang. 2011. Preparation, purification and characterization of alginate oligosaccharides degraded by alginate lyase from *Pseudomonas* sp. HZJ 216. *Carbohydrate Research*, 346(6), 794-800.
- Li, S. Y., Z. Wang, L. Wang, and S. F. Zhao. 2019. Combined enzymatic hydrolysis and selective fermentation for green production of alginate oligosaccharides from *Laminaria japonica*. *Bioresource Technology*, 281, 84-89
- Li, S., L. Wang, X. Chen, and Y. Zhao. 2016. Preparation, characterization, and biological activities of alginate oligosaccharides. A review. *Carbohydrate Polymers*, 154, 1-10.
- Mahata, M. E. 2015. *Potensi Rumput Laut Coklat Dari Pantai Sungai Nipah sebagai pakan ternak*. Padang. Penelitian Mandiri Fakultas Peternakan Universitas Andalas.
- Maharani, A. A., A. Husni, dan N. Ekantari. 2017. Karakteristik natrium alginat rumput laut cokelat *Sargassum fluitans* dengan metode ekstraksi yang berbeda. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 20(3), 478-487.
- Manteau, Nurjanah dan T. Nurhayati. 2018. Studi identifikasi crude Karakteristik Rumput Laut Cokelat (*Sargassum polycystum* dan *Padina minor*) dari perairan Pohuwatu, Provinsi Gorontalo. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 21(3):396-405
- Mao, S., T. Zhang, W. Sun, and X. Ren. 2012. The depolymerization of sodium alginate by oxidative degradation. *Pharmaceutical development and technology*, 17(6), 763-769.
- Ming, L., Lei, and Y. I. Bao. 2021. Alginate oligosaccharides preparation, biological activities and their application in livestock and poultry. *Journal of Integrative Agriculture*, 20(1), 24-34.
- Modibbo, U. U., S. Osemeahon, M. Shagal, and M. Halilu. 2014. Effect of moisture content on the drying rate using traditional open sun and shade drying of fish. *IOSR J Applied Chem*. 7(1): 41-45.
- Mohdy, A. H. L. 2017. Radiation-induced degradation of sodium alginate and its plant growth promotion effect. *Arabian Journal of Chemistry*, 10(1): 431-438.
- Mwalugha, H. M., J. Wakibia, M. Glasston, and M. A. Mwasaru. 2015. Chemical composition of common seaweeds from the Kenya coast. *Journal of Food Research*, 4(6), 28-36.
- Nainggolan, N., Seprianto, and R. Kusumawati. 2021. Synthesis of alginate oligosaccharide (AOS) using different solvent. *Indonesian Journal of Biotechnology and Biodiversity*, 5(3), 70-83

- Nesic, A. 2023. Microwave assisted extraction of raw alginate as a sustainable and cost-effective method to treat beach-accumulated Sargassum algae. PMC.
- Ning, Y. 2011. Synthesis and Characterisation of Biodegradable Superabsorbent polymer Derived From Sodium Alginate. Laporan Thesis. Faculty of Engineering and Science University Tunku Abdul Rahman
- Nurjanah, N., A. Azka, dan A. Abdullah. 2012. Aktivitas Antioksidan dan Komponen Bioaktif Semanggi Air (*Marsilea crenata*). Asian Journal of Innovation and Entrepreneurship, 1(03), 152-158.
- Perumala, P., C. Huang, Chen, and Singhanian. 2023. Advances in oligosaccharides production from brown seaweeds: Extraction, characterization, antimetabolic syndrome, and other potential applications. Bioengineered, 14(1), 2158556.
- Ramnani, P., R. Chitarrari, K. Tuohy, and I. Rowland. 2012. In vitro fermentation and prebiotic potential of novel low molecular weight polysaccharides derived from agar and alginate seaweeds , 18 (1), 1-6.
- Reski, S. 2015. Pengaruh Penggunaan Tiga Jenis Rumput Laut dalam Ransum Terhadap Bobot Hidup, Persentase Karkas dan Persentase Lemak Abdomen Broiler. Fakultas Peternakan. Universitas Andalas. Padang
- Reski, S., L. Suhartati., M. E. Mahata. 2021. Peningkatan kualitas gizi rumput laut *turbinaria murayana* dengan teknologi fermentasi menggunakan mikroorganisme lokal (mol) sebagai bahan pakan ternak unggas. Jurnal Ilmiah Peternakan Terpadu. 9(2): 120-128
- Reski. S., R. K. Rusli, M. E. Mahata. 2022. Pengaruh penggunaan produk fermentasi rumput laut *Turbinaria murayana* dalam ransum terhadap organ pencernaan dan aksesoris broiler. Jurnal Peternakan Indonesia.,24(2):199–205. doi:10.25077/jpi.24.2.199205.2022
- Reski, S., M. E. Mahata, A. Yuniza, and Y. Rizal. 2025. Alginate extraction from *Turbinaria murayana* seaweed as a feed additive for poultry. Adv. Anim. Vet. Sci, 13(6), 1184-1190
- Rinaudo, M. 2014. Main properties and current applications of some polysaccharides as biomaterials. Polymer International.
- Subaryono, R. Peranginangin, and M. T. Suhartono. 2013. Alginate lyases: sources, mechanism of activity and potensial application. *Squalen Bulletin of Marine & Fisheries Postharvest & Biotechnology*, 8(3), 105-116.

- Subaryono. 2010. Modifikasi alginat dan pemanfaatan produknya. *Jurnal Squalen*. 5(1): 1-7.
- Subaryono, R. Perangiangin, M. T. Suhartono. 2017. Immunomodulator activity of alginate oligosaccharides from alginate *Sargassum crassifolium*. *J. Pengol. Hasil Perikanan*. Bahasa Indonesia. 20(1);63-73.
- Subagan, K., Suhendra, dan N. M. Wartini, 2020. Karakteristik Bubuk Alginat dari Alga Coklat *Sargassum* sp. pada Perlakuan Waktu dan Suhu Maserasi, *Jurnal Rekayasa dan Manajemen Agroindustri*, 8(1):105-113. DOI: 10.24843/jrma.2020.v08.i01.p11.
- Sugiono, S., N. Nurjanah, dan A. Abdullah. 2022. Karakteristik fisik dan kimia alginat dari rumput laut coklat. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 25(2), 200–210.
- Steel, R.G.D., and J.H. Torrie. 1995. Prinsip dan Prosedur Statistik Suatu Pendekatan Biometrik. Terjemahan oleh Bambang Sumantri. PT Gramedia Utama. Jakarta.
- Szekalska, M., M. Wroblewska, and K. Winnick. 2019. Alginate oligosaccharides affect mechanical properties and antifungal activity of alginate buccal films with posaconazole. *Marine Drugs*, 17(12), 692.
- Szekalska, M., A. Cetner, and K. Winnicka. 2021. Biophysico-chemical properties of alginate oligomers obtained by acid and oxidation depolymerization. *Polymers*, 13(14), 2258.
- Ummat, V., S. Sivagnanam, M. Pednekar, and Tiwari. 2024. Sequential extraction of fucoidan, laminarin, mannitol, alginate and protein from the brown macroalgae *Ascophyllum nodosum* and *Fucus vesiculosus*. *International Journal of Biological Macromolecules*, 256, 128195.
- Wang, J., Q. Zhang, Z. Zhang, and Z. Li. 2012. Antioxidant activity of sulfated polysaccharide fractions extracted from *Laminaria japonica*. *International Journal of Biological Macromolecules*.
- Wang, M., L. Chen, and Z. Zhang. 2021. Potential biomedical applications of alginate oligosaccharides: A review. *Carbohydrate Polymers*, 271, 118408.
- Yamasaki, Y, T. Yokose, T. Nishikawa, and K. Yamaguchi, *et al.* 2012. Effects of alginate oligosaccharide mixtures on the growth and fatty acid composition of the green alga *Chlamydomonas reinhardtii*. *Journal of Bioscience and Bioengineering*, 113:112–6
- Yanuarto, Y., A. Nururrozi, S. Indarjulianto, dan S. Raharjo. 2018. Manure unggas: Suplemen pakan alternatif dan dampak terhadap lingkungan. *Journal of the Indonesian Tropical Animal Agriculture*, 43(2), 195–204.

- Yao, K., and J. Li. 2020. Water sorption properties of polysaccharide films: Influence of molecular structure and relative humidity. *Journal of Food Engineering*, 200, 54–63.
- Zhang, H., W. Mao, F. Fang, and Y. Chen. 2023. Preparation, structural characterization, and bioactivities of alginate oligosaccharides: A review. *International Journal of Biological Macromolecules*, 233, 123456
- Zhao, X., H. Sun, and J. Wang. 2016. Effects of thermal processing on the structure and water retention properties of polysaccharides. *Carbohydrate Polymers*, 150, 242–249.
- Zhu, B., F. Ni, Q. Xiong, and Z. Yao. 2018. Marine oligosaccharides originated from seaweeds: Source, preparation, and biological activities. *Marine Drugs*, 16(11), 400
- Zhu L., Y. Feng, D. Hu, and Y. Hu. 2023. Enzymatically prepared alginate oligosaccharides improve broiler chicken growth performance by modulating the gut microbiota and growth hormone signals. *Journal of Animal Science and Biotechnology*, 14(1),

